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Device and method for automatically building database for home zone service

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ABSTRACT OF THE DISCLOSURE

A device and method for automatically building a database for a home zone service in a mobile communication system. A memory includes an address location database for storing latitude and longitude data corresponding to respective addresses, and a zone database for storing zone data for respective locations. A client registration processor creates, upon receipt of client information, a client database in the memory. A database processor searches, when registration of a new client is requested by the client registration processor, the address location database for latitude and longitude corresponding to the client's address, searches the zone database for zone data for a location corresponding to said latitude and longitude, and creates a home zone database in the memory by taking the zone data as home zone data for the client.

AUSTRALIA

Patents Act 1990

COMPLETE SPECIFICATION

STANDARD PATENT

Applicant(s):

SAMSUNG ELECTRONICS CO., LTD.

Invention Title:

DEVICE AND METHOD FOR AUTOMATICALLY BUILDING DATABASE FOR HOME ZONE SERVICE

The following statement is a full description of this invention, including the best method of performing it known to me/us:

DEVICE AND METHOD FOR AUTOMATICALLY BUILDING DATABASE FOR HOME ZONE SERVICE

PRIORITY

This application claims priority to an application entitled "Device and Method for Automatically Building Database for Home Zone Service" filed in the Korean Industrial Property Office on August 4, 1999 and assigned Serial No. 99-32036, the contents of which are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to a mobile communication system, and in particular, to a device and method for automatically building a database for a home zone service in a mobile communication system.

2. Description of the Related Art

In recent, various services are provided by the mobile communication service providers to strengthen their competitiveness. For example, there are provided a data service, a pre-paid service, and a home zone service. The home zone service is defined as follows.

When a client talks over a mobile telephone in a specified zone, called a home zone (e.g., home), he or she will be charged the same call fee as the fee for the local wire call. In this case, a national significant number (NSN) is used for billing. However, when the client (or client) talks over the mobile telephone out of the home zone, he will be charged a call fee for the mobile telephone. In this

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case, a mobile directory number (MDN) is used for billing.

In order to apply a different fee rate according to the locations where the client talks over the mobile telephone, the mobile communication service providers should previously have the related information (e.g., classified locations, registered clients, and classes of the registered clients), and the accuracy and details of the information affects the quality of service (QoS).

SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to provide a device and method for automatically building a database for a home zone service in a mobile communication system.

To achieve the above and other objects, there is provided a device for building a database for a home zone service in a mobile communication system. In the device, a memory includes an address location database for storing latitude and longitude data corresponding to respective addresses, and a zone database for storing zone data for respective locations. A client registration processor creates, upon receipt of client information, a client database in the memory. A database processor searches, when registration of a new client is requested by the client registration processor, the address location database for latitude and longitude corresponding to the client's address, searches the zone database for zone data for a location corresponding to said latitude and longitude, and creates a home zone database in the memory by taking the zone data as home zone data for the client.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the present

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invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings in which:

FIG. 1 is a diagram illustrating neighbor base stations for a home zone service and their coverages;

FIG. 2 is a diagram illustrating a client information database for a home zone service according to an embodiment of the present invention;

FIG. 3 is a diagram illustrating a system for building a database for a home zone service according to an embodiment of the present invention; and

FIG. 4 is a flow chart illustrating a method for building a database for a home zone service according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment of the present invention will be described herein below with reference to the accompanying drawings. In the following description, well-known functions or constructions are not described in detail since they would obscure the invention in unnecessary detail.

For the home zone service, it is necessary to first detect a location where the mobile telephone is presently located. Thereafter, it is determined whether the location of the mobile telephone belongs to a previously registered home zone, to apply a different fee rate according to the determined results.

FIG. 1 illustrates neighbor base stations for the home zone service and their coverages.

Referring to FIG. 1, reference numeral 10 indicates a home of the client, centering on which the client desires to form a home zone. Reference numeral 20 indicates the zone having a specific radius centered on the client's home 10, which is call a home zone. Reference numerals 30, 40 and 50 indicate coverages

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of base stations A, B and C neighboring to the client, respectively.

The client's home zone 20 is specified by the base station ID of the service base station, the sector ID and the distance from the neighbor base station. Therefore, the above items become elements for building a database for the home zone service. The distance includes the minimum distance in the direction of the base station and the maximum distance in the opposite direction of the base station. This distance can be expressed in terms of a round trip delay (RTD), which is determined by dividing the distance by the ray velocity (C=300,000Km) and then multiplying the resulting value by 2, considering the round trip. The base station measures the round trip time by measuring a time required when a signal radiated from the base station returns from the mobile telephone. The round trip time can be represented by

$$RTD_i = 2 \times (D_i/C) \quad \ldots . (1)$$

where 'i' is 1 or 2, and D_i is a variable indicating the minimum distance in the direction of the base station, for i=1 and indicating the maximum distance in the opposite direction of the base station, for i=2.

FIG. 2 illustrates a client information database for the home zone service according to an embodiment of the present invention, wherein two clients are registered, by way of example.

Referring to FIG. 2, a first client, Robert, resides at 23 Murray Hill, New Jersey, uses 032-779-8180 for NSN in the home zone, and uses 011-779-xxxx for MDN out of the home zone. The Robert's home can be serviced by 3 neighbor base stations. The home zone in which the Robert's home is registered corresponds to a zone within 16-40 chips from an α sector of a base station #1.

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Here, '16' and '40' indicate an RTD value, and the actual distance becomes a distance of 8-20 chips from the base station. Further, the home zone corresponds to a zone within 10-22 chips from a β sector of a base station #2, and corresponds to a zone within 12-24 chips from a γ sector of a base station #3. Here, a 1-chip distance corresponds to 245 meters determined by dividing the distance 3000,000 Km by 1.2244 MHz which is a CDMA (Code Division Multiple Access) modulation frequency.

The proper number of the base stations varies according to the geographical features of the home zone, as shown in Table 1 below.

[Table 1]

Zones	Cell Radius	No of BSs Required for Home Zone Service
Building Zone	0.4Km	8
Large City	2.7Km	6
Small Town	4.2Km	4
Suburb	7.3Km	3

An initial database for the home zone service is created based on coverage simulation data and a location database before the service is performed. During the home zone service, the database will be optimized according to the actual radio environment and the user's call habit (e.g., the main call time and location).

When building the database manually, the operator should perform the following steps by hands, causing an increase in the required operating time. Therefore, when the clients increase in number, it is necessary to automatize a part of or whole the process.

Step 1: When a new client provides his address to request (or register)

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the home zone service, the operator receives the address.

Step 2: The operator determines a location by looking the address up in the map, and converts the location into latitude and longitude data.

Step 3: The operator searches a network design map for the latitude and the longitude. To this end, it is necessary to previously obtain network design data indicating a coverage of the base station.

Step 4: The operator searches the network design map for the base station ID, the sector ID and the distance from the base station which services the client.

Step 5: Step 4 is repeatedly performed on the locations other than the fixed home address, within a specific radius (e.g., 1 Km).

Step 6: The operator creates a database for the corresponding client based on the results (base station IDs, sector IDs and distances) determined in Steps 4 and 5.

If there are some changes such as a move of the base station, Steps 3 to 6 are repeatedly performed on every client in the corresponding zone. In addition, when the client has changed his residence, Steps 1 to 6 are repeatedly performed on the corresponding client.

FIG. 3 illustrates a system for building a database for the home zone service according to an embodiment of the present invention.

Referring to FIG. 3, a memory 200 includes a client database (CDB) 250, an address location database (ALDB) 260, a zone database (ZDB) 270, and a

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home zone database (HZDB) 280. The client database 250 stores data (e.g., name, address, service type, telephone number #1 (e.g., NSN) and telephone number #2 (e.g., MDN)) which is registered when the client (or subscriber) requests a subscription to the home zone service. The address location database 260 stores location information (latitude and longitude data) for every address in the service zone. The zone database 270 has zone data (base station ID, sector ID, and RTD) for every location, and is created using a cell planning tool. That is, by applying a landscape database (now shown) to the cell planning tool, it is possible to calculate radio wave strength prediction values according to the geographical feature. The coverages of the base stations are determined by predicting the radio wave strength compensated by adding actually-measured information to the calculated calculate radio wave strength prediction values. Based on these values, the zone database 270 is created. This data includes the base station ID of a base station covering the respective locations, the sector ID and the RTD between the respective locations and the corresponding base station. Although the RTD initially has a calculated value at each location, it is compensated (or modified) to an RTD value measured by the base station at a time when there is the highest probability that the client will stay in the home zone, in order to compensate for an error due to the actual radio environment.

The cell planning tool is a software application for simulating the radio environment. There are several radio environment analysis models used for the cell planning tool (e.g., Okumura, HATA, Cost231, Ray tracing). To implement the home zone database according to an embodiment of the present invention, there are used a handoff server function and an N-th likely server function out of the cell planning tool functions.

The handoff server function indicates a handoff zone according to a signal-to-noise (S/N) ratio (or Ec/Io in a CDMA system). The handoff server function indicates the names and number of the base stations which can perform

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soft or softer handoff at each location. This function is used for the wider home zone of over 1 Km. All the base stations supporting the handoff within the home zone are set to base stations supporting the home zone service.

The N-th likely server function indicates information (name, strength, and distance information) for a maximum of N base stations out of the base stations which transmit forward channel signals having strength higher than a specific value at each location. This function is used for the narrow home zone of about 500m. Here, 'N' is determined according to the geographical features shown in Table 1.

A processing unit 100 includes a client registration processor 110 and a database processor 120. The client registration processor 110 creates the client database 250 by receiving client information. The database processor 120 searches, upon detecting registration of a new client, the address location database 260 for the latitude and the longitude corresponding to the client's address, and creates the home zone database 280 by taking the zone data of the location corresponding to the latitude and the longitude as the home zone data corresponding to the client, consulting the zone database 270.

FIG. 4 illustrates a method for building a database for the home zone service according to an embodiment of the present invention.

To request (or register) the home zone service, the client will provide his name and address to the operator. When the operator inputs the client's name and address to the system, the client registration processor 110 of FIG. 3 will create the client database 250.

The database processor 120 determines in step 4a whether a new client has been registered. Upon detecting registration of a new client, the database

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processor 120 searches the address location database 260 for the latitude and the longitude corresponding to the client's address in step 4b. Thereafter, in step 4c, the database processor 120 searches the zone database 270 for a location corresponding to the searched latitude and longitude. The database processor 120 searches the zone data (i.e., base station ID, sector ID, and RTD) for the searched zone in step 4d, to create the home zone database 280 using the zone data. In step 4e, the database processor 120 searches other locations within a specific distance from the searched location, and adds zone data for the searched locations to the home zone database 280.

The home zone database created through this process is stored in the base station or an operating center. By comparing the stored database with the presently measured location of the mobile telephone, it is determined whether the mobile telephone locates in the home zone. Based on the determined results, it is possible to determine whether to apply the home zone fee rate or the normal fee rate of the mobile telephone.

As described above, the invention can automatically build an accurate client database for the home zone service.

While the invention has been shown and described with reference to a certain preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

For the purposes of this specification it will be clearly understood that the word "comprising" means "including but not limited to", and that the word "comprises" has a corresponding meaning.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A device for building a database for a home zone service in a mobile communication system, comprising:

a memory including an address location database for storing latitude and longitude data corresponding to respective addresses, and a zone database for storing zone data for respective locations;

a client registration processor for creating, upon receipt of client information, a client database in the memory; and

a database processor for searching, when registration of a new client is requested by the client registration processor, the address location database for latitude and longitude corresponding to the client's address, searching the zone database for zone data for a location corresponding to said latitude and longitude, and creating a home zone database in the memory by taking the zone data as home zone data for the client.

2. The device as claimed in claim 1, wherein the database processor searches the zone database for locations within a specific range from the location corresponding to the client's address, and adds zone data of the searched locations to the home zone database as home zone data corresponding to the client.

3. The device as claimed in claim 1, wherein the client registration processor creates the client database by receiving a service type of the client and receiving one of or both of a telephone number for a home zone fee and a telephone number for an out-of-home zone fee according to the service type of the client.

4. The device as claimed in claim 1, wherein the zone data includes a base station ID and a sector ID.

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5. The device as claimed in claim 4, wherein the zone data includes minimum and maximum round trip delay.

6. The device as claimed in claim 5, wherein the round trip delay is a value determined by automatically compensating a value calculated by a cell planning tool for an error due to an actual radio environment.

7. A method for building a database for a home zone service in a mobile communication system including an address location database for storing latitude and longitude data corresponding to respective addresses, and a zone database for storing zone data for respective locations, the method comprising the steps of:

(a) receiving a client's address;

(b) searching the address location database for latitude and longitude corresponding to the received client's address;

(c) searching the zone database for zone data for a location corresponding to the searched latitude and longitude; and

(d) creating a home zone database by taking the searched zone data as home zone data of the client.

8. The method as claimed in claim 7, further comprising the steps of:

(e) searching zone data of locations within a specific range from the searched location; and

(f) adding the searched zone data to the home zone database as home zone data of the client.

Dated this 4th day of August 2000
SAMSUNG ELECTRONICS CO., LTD.
By their Patent Attorneys
GRIFFITH HACK
Fellows Institute of Patent and
Trade Mark Attorneys of Australia

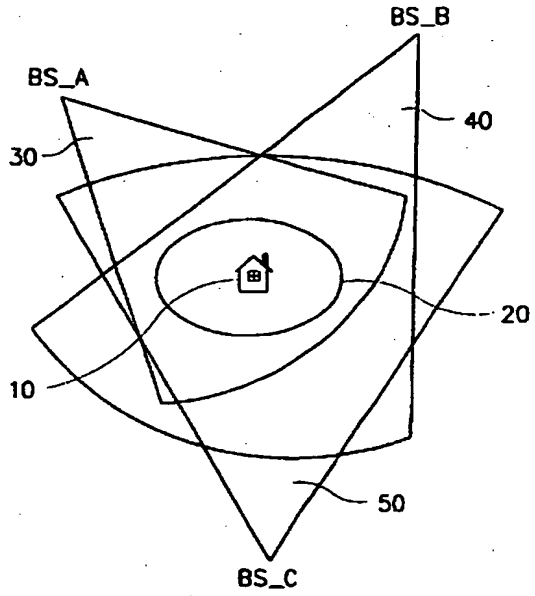

FIG. 1

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NAME	ADDRESS	PHONE NO #1 (NSN)	PHONE NO #2 (MDN)	BS ID, SECTOR ID, RTD(MAX/MIN)		
ROBERT	23 MURRAY HIL, NEW JERSEY	0342-779 -8180	011-779 -xxxx	1, α,16/40	1, β,20/44	3, γ,24/48
DAVID	31 ROCHESTER, NWE YORK	0999-999 -9999	011-yyy -yyyy	3, α,10/34	4, β,10/34	5, γ,22/46

FIG. 2

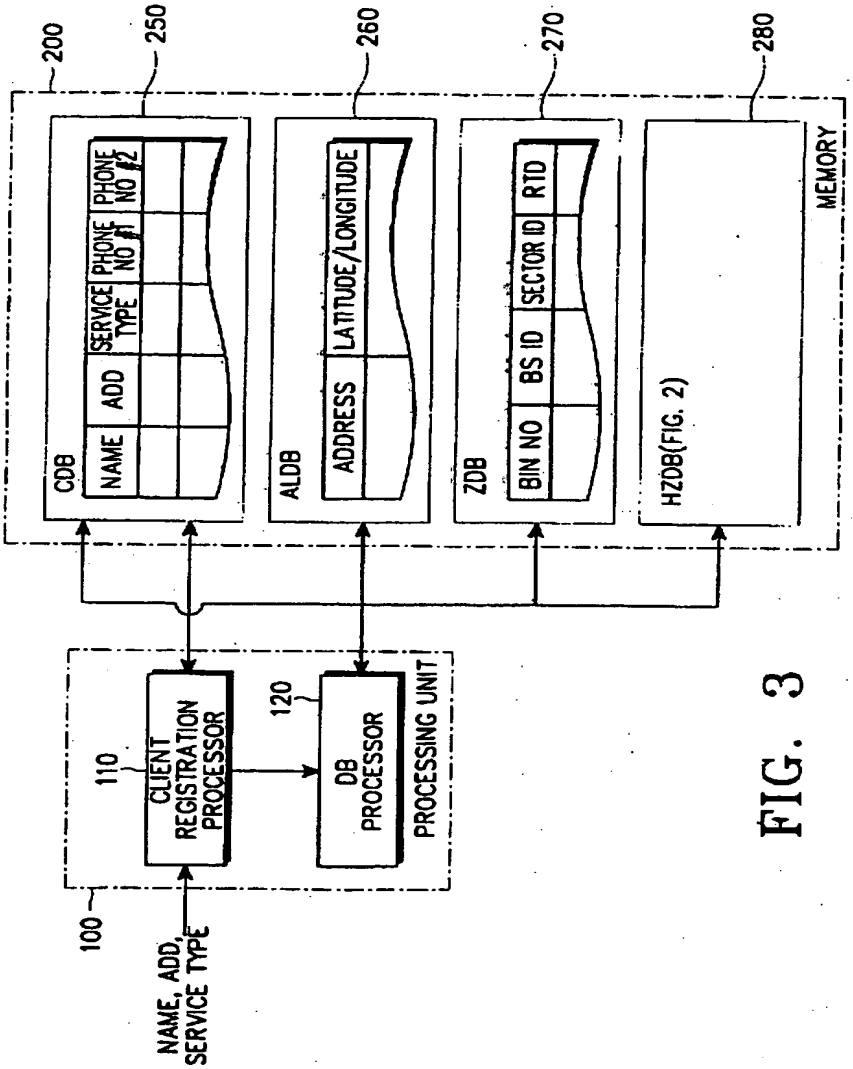
200
250
260
270
280
MEMORY
CDB
NAME
ADD
SERVICE TYPE
PHONE NO #1
PHONE NO #2
ALDB
ADDRESS
LATITUDE/LONGITUDE
ZDB
BIN NO
BS ID
SECTOR ID
RTID
HZDB(FIG. 2)
PROCESSING UNIT
110
CLIENT REGISTRATION PROCESSOR
120
DB PROCESSOR
100
NAME, ADD, SERVICE TYPE

FIG. 3

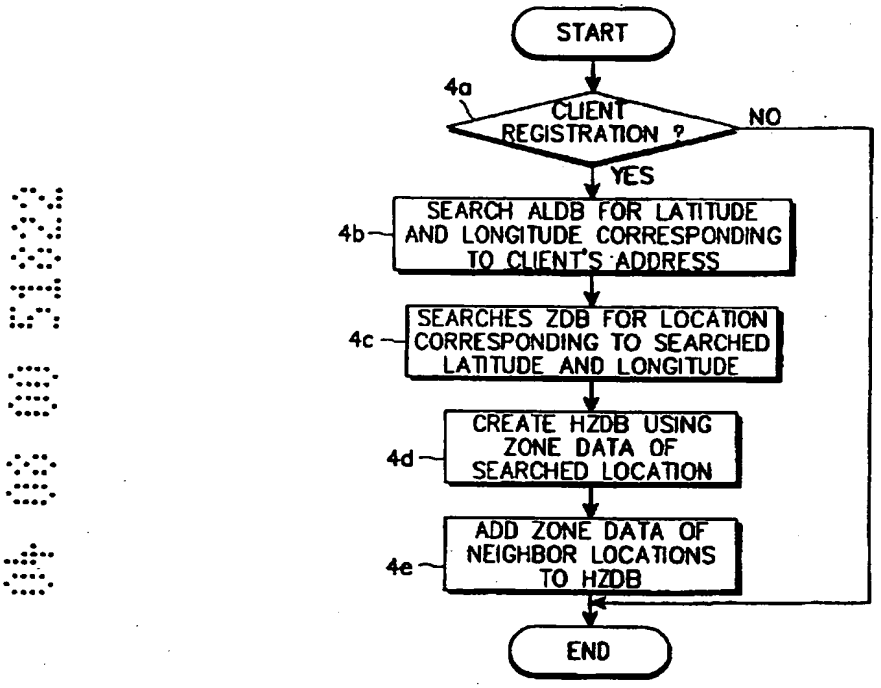
START
4a
CLIENT REGISTRATION ?
NO
YES
4b
SEARCH ALDB FOR LATITUDE AND LONGITUDE CORRESPONDING TO CLIENT'S ADDRESS
4c
SEARCHES ZDB FOR LOCATION CORRESPONDING TO SEARCHED LATITUDE AND LONGITUDE
4d
CREATE HZDB USING ZONE DATA OF SEARCHED LOCATION
4e
ADD ZONE DATA OF NEIGHBOR LOCATIONS TO HZDB
END

FIG. 4